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Global Inequality and the Global Inequality Extraction Ratio

The Story of the Past Two Centuries

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Abstract

Using social tables, the author makes an estimate of global inequality (inequality among world citizens) in the early 19th century. The analysis shows that the level and composition of global inequality have changed over the past two centuries. The level has increased, reaching a high plateau around the 1950s, and the main determinants of global inequality have become differences in mean country incomes rather than inequalities within nations. The inequality extraction ratio (the percentage of total inequality that was extracted by global elites) has remained surprisingly stable, at around 70 percent of the maximum global Gini, during the past 100 years.

This paper—a product of the Poverty and Inequality Team, Development Research Group—is part of a larger effort in the department to study inequality in its historical perspective. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at bmilanovic@worldbank.org.

Global inequality and the global inequality extraction ratio: The story of the past two centuries

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Introduction: Pre-industrial global inequality

The studies of global, and a fortiori, global pre-industrial inequality are a relatively recent phenomenon and they are few in number. Obviously, the reason is the lack of household survey data that are needed to estimate global inequality, that is, income distribution across all individuals in the world. The lack of household surveys and their variable quality are problems that plague even *contemporary* studies of global inequality. They are much more severe for studies of past inequality. But even the very concept of global inequality—that is, of measuring and comparing incomes of (theoretically) all individuals in the world—is a new one, both because the idea of such a study had to wait for a more advanced stage of globalization to take hold, and because it crucially depends on the availability of purchasing power parity estimates that are needed to convert incomes expressed in national currency into a single global numeraire.

There are only two long-run empirical historical studies of global inequality. The first and seminal work was done by François Bourguignon and Christian Morrisson in their 2002 *American Economic Review* paper which estimated global inequality from 1820 to 1992. The estimates were made at more or less regular 20-year intervals. The Bourguignon-Morrisson approach relied on two building blocks. The mean incomes of countries were taken from Maddison (2004 or earlier) while 33 income distributions of uneven quality and coverage were put together by Christian Morrisson to represent various parts of the globe. "Similar" countries were allocated the same income distribution, coming from a country for which such data were available. This has, for obvious reasons, led to many simplifications. In addition, Bourguignon and Morrisson used in many cases the 20th century distributions to "interpolate" (backward predict) the 19th century distributions for the countries for which 19th century data were unavailable. Thus, the number of data points (fractiles of the distributions) which they show for each benchmark year, say, 1820, 1850 etc. (33 "countries" times 11 fractiles [2]) are not all really independent and

[2] For 33 "representative" distributions, Bourguignon and Morrisson give 11 data points per country (nine bottom deciles and two top ventiles). However, these are the already "processed" data and it is not clear how many actual independent data points the authors had. For example, if only a Gini is available for a given country/year and the authors assume a lognormal distribution, then there is not a single fractile

contemporary data points but estimates based on posterior data.[3] Although their approach was in several respects less than ideal, it was, at that time, perhaps the only possible since historical income distributions are so scarce.

More recently, Baten, Foldvari, van Leeuwen, and van Zanden (2009) [in the rest of the text BFLZ] have expanded and improved on the Bourguignon and Morrisson approach by using for the countries for which actual income distribution data were lacking either (i) an estimate of inequality based on the evolution of the unskilled wage/GDP ratio,[4] or (ii) by substituting for the missing income distributions, the data on the distribution of individual heights. For (i), if unskilled wage-to-GDP ratio increases, the assumption is that income inequality declines; for (ii), if there is a strong correlation between distribution of individual heights and distribution of income, then we can "enrich" the dataset on countries' income distributions by adding the data on countries for which we possess the distributions of heights.[5] In that way, the Bourguignon-Morrisson "backward projections" are not used at all. The other building block of the exercise, the reliance on Maddison's GDP per capita data, remained.

In this paper, I proceed to do three things. First, I use social tables from thirteen 18th and 19th century countries to estimate global inequality for the early 19th century. Social tables have not been used for such a purpose before. Second, I present a story of global inequality between the beginning of the 19th and the beginning of the 21st century that at its two end-points relies on my own estimates, and uses Bourguignon-Morrisson or BFLZ estimates for the years in-between. Third, I apply the concept of the inequality extraction ratio (used earlier by Milanovic (2006), and Milanovic, Lindert and Williamson (2009) within country-wide framework) to the global scale. In other words, I ask how close was global inequality to its maximum feasible amount during the last two centuries. I conclude the paper with some speculative notes.

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datum, but just an overall statistic like the Gini, available. It is also possible, that, basing themselves on published quintiles, Bourguignon and Morrisson estimated deciles.

[3] The point was made by Baten, Foldvari, van Leeuwen, and van Zanden (2009)

[4] The approach was pioneered by Williamson (1998). It was used most recently by Prados de la Escosura (2008).

[5] The approach was introduced by Baten (2000).

1. Global inequality in the early XIXth century

The data. Let us start with the two building blocks. For GDP per capita, I too use Maddison's data for all countries for which they are available. I do this, to some extent, *faute de mieux* because Maddison's data may be in the need of serious revisions on account of new, and for China, India, Indonesia, etc., dramatically different, estimates of the domestic price levels by the 2005 International Comparison Project. The upward revisions of domestic price levels led to the corresponding reduction of these countries' current PPP (purchasing power parity) "real" incomes. This level change then "percolates" (carries over) to the historical income levels which are calculated by applying past domestic real growth rates to the 2005 level.[6] However, since these revisions have not yet been done by Maddison or anyone else (and they would need to be massive), I use Maddison's 2004 GDP per capita data expressed in Geary-Khamis 1990 international dollars.

The second building block, the income distribution data, comes from the social tables for 13 countries that have been calculated by different authors and put together within a single framework by Milanovic, Lindert and Williamson, MLW, (2009). The social tables are our unique source of information about income distribution in preindustrial societies where neither household surveys nor tax censuses were conducted. Following upon the first one created by Gregory King for England and Wales in 1688, social tables list salient social classes and give estimates of their average income (by class) and number of people or households who belong to it. Some are more detailed than others, and cover the entire range of the of income pyramid, from the top (e.g. high nobility) to the bottom (vagrants and beggars). Others are, of course, more parsimonious or simple and may include just a few classes (say, nobility, merchants and urban population, and farmers). MLW (2009) studied preindustrial inequality using thirty such social tables, some of which were created by the contemporary authors and others by economic historians. (Detailed explanation of all social tables is available in an annex to MLW paper.)

[6] See Milanovic (2009).

For the "early" 19th century I use the "time window" of 1750-1880. The time window is wide. This is due to the fact that, in order to have a sufficiently comprehensive coverage of the world, I need to include both India and China. Now, the social table for the Moghul India is available for the year 1750, while the first social table for China is for the year 1880. The dates of these two social tables therefore frame our time window. In-between, from Europe, I have social tables from Old Castille 1752, France 1788, England and Wales 1801, the Netherlands 1808, and Kingdom of Naples 1811; from Latin America, I have Nueva Espaňa (Mexico) 1790, Chile 1861, Brazil 1872 and Peru 1876. Finally, there is an additional social table from Asia (Java 1880), and one from Africa (Maghreb 1880).

In reality, as this list makes clear, the future advanced (developed) countries have their social tables up to the early 19th century only. That was intentionally done in MLW paper, which dealt with pre-industrial inequality, so as to limit the investigation to not yet industrialized countries. As is conventionally believed, after the end of the Napoleonic wars, Great Britain, France, Belgium and the Netherlands were already engaged in industrialization. But for other countries, MLW collected social tables up to a much later date (since these countries were still preindustrial). In the context of this paper, it means that one can argue that treating the whole sample as giving a snapshot of pre-industrial global inequality, around early to mid 19th century, does not involve a significant bias. This is because GDP per capita of countries that enter our sample at later dates (the three Latin American countries, Maghreb, Java and China) registered no appreciable economic progress between the early 19th century and 1860-1880 when they enter the sample. According to Maddison (2004), China's GDP per capita decreased from $PPP 600 in 1820 to $PPP 530 in 1870 (no datum for 1880 is given). For Indonesia, the change was from $PPP 612 in 1820 to $PPP 654 in 1880. For Brazil, it was from $PPP 647 in 1820 to $PPP 718 in 1870. Since most of global inequality after 1820 was driven by fast growth of the industrializing nations while economies and income distributions of other nations were basically stagnant between the early 19th century and 1870-1880 when they enter the sample, we can assume that our sample gives a reasonable snapshot of global inequality around 1820.

The social tables from the period 1750-1880 include 650 million people. According to Maddison, total world population moved from almost 1 billion in 1820 to 1.1 billion in 1850 to 1.2 billion in 1870. Therefore an average population at any point between 1750 and 1880 can be estimated at around a billion. Our time-window therefore comprises around 2/3 of the world population living at any point between 1750 and 1880.

How are average social group incomes converted into equivalent 1990 PPPs? The 13 social tables that we use have in total 591 social groups or classes. That means that we have average incomes, expressed in national currencies, for 591 social groups. (One such social table for England and Wales 1801-03 is given in the Annex.) These national currency income per social group are converted into 1990 PPP dollars using (i) Maddison GDP per capita data and, (ii) for the countries for which Maddison's data are unavailable, the ratio between average income and the subsistence minimum with the latter priced at $PPP 300 per year. According to the first method, the social class income estimates are made by linking overall national currency mean income (calculated across all social groups) to GDP per capita in 1990 international prices from Maddison. To explain: from the social table for (say) Brazil in 1872, we calculate that the average per capita income is 311 *milreis*. From Maddison's (2004) GDP per capita data, we know that the estimated GDP per capita for Brazil in 1872 is $PPP 721. By linking the two, we obtain the conversion ratio of 1872 *milreis* into 1990 international dollars (1 *milreis* is worth $PPP 2.3 of year 1990). This then enables us to directly convert average *milreis* income of every social class into its 1990 $PPP equivalents. For some data prior to 1820, the procedure is different. When we do not have Maddison's GDP per capita data, we need to get an estimate of the subsistence minimum in local currency (of the time). Thus, for example for the Kingdom of Naples 1811, the estimated subsistence minimum is 31 *ducats* per capita annually (from Melanima 2000). Since the subsistence minimum is by assumption priced at $300 PPP dollars at 1990 prices, we again directly get the conversion factor (1 *ducat* from year 1811 = $PPP 9.67 in year 1990). Using this conversion factor, we convert mean contemporary *ducat* incomes of each social class into 1990 $PPP equivalents.

We thus obtain $PPP-equivalent average incomes for all 591 social groups that are included in our sample. The number of groups and their population sizes vary between the countries. The number of social groups ranges from only 3 for China in 1880 and Nueva Espaňa in 1790 to 375 for Brazil 1872. The average number of social groups per country is 45 (without Brazil, the average number of groups drops to 18). On average, therefore the number of groups is sufficiently large to provide a reasonable estimate of overall inequality within each nation. [7]Although a small number of groups biases the national Gini downward, the bias need not be strong if the social structure of a society is not very complex. For example, if most of peasants lived at, or near, the subsistence minimum in China around 1880, then the fact that we have only three social groups for China, need not imply a strong downward bias to the calculated inequality. (The presumption is also that the authors of social tables divided each society into salient and sufficiently income-differentiated groups, so that most of country's inequality is captured by income differences between social groups.)

Global inequality around 1820. The average income for our sample is $PPP 600. The country with the highest mean income is England and Wales 1801-03 with $PPP 2000, the country with the lowest, Moghul India in 1750 with $PPP 530.

Inequality indices for the sample are given in Table 1. The global Gini works out as 38.5. Table 1 also compares this result with Bourguignon and Morrison calculations for 1820. The Gini of 38.5 is significantly lower than the Bourguignon-Morrison value of 50. An obvious reason is smaller coverage of our dataset. As mentioned above, it provides the coverage for 2/3 of the world population that has, on average, lived during that period. But if for all the missing countries, we supplement our data with the data from

[7] However, for the discussion of this point see Milanovic, Lindert and Williamson (2009).

Bourguignon and Morrisson (16 countries)[8], we increase the coverage to about 90 percent, the number of independent data points to 767, and the global Gini goes up to 43.3. This will be our estimate for the early 19th century global inequality. It is not far from the BFLZ (2009) estimate of 47 (see their Table 4). As I shall argue below, Bourguignon and Morrisson estimate of Gini 50 for 1820 seems implausibly large.

In comparison with today's inequality, global inequality in the period 1750-1880 was much lower. The most recent global inequality estimate, calculated from individual household survey data around year 2002, is 65 Gini points, using the "old" PPPs which are based on the same ("old") benchmark as the 1990 PPPs used by Maddison. If we use the more recent PPP values (from the 2005 International Comparison Project), the global Gini is 70.7. The increase is due to a significant reduction of GDPs per capita or average household incomes for China, India and several other Asian countries (see Milanovic, 2009).

It is interesting to focus on the highest incomes in our sample. Incomes above $PPP 70,000 per capita, which would place such individuals into the top global percentile *today*, are registered in the Netherlands, Java (which was a Dutch colony then), Chile and (a practically negligible number) in Brazil. The total number of people with such high incomes is minute however. It was less than 5,000 (out of 650 million people). Yet it is clear that enormously rich people, by today's standards, lived then too.

[8] The "countries" are Austria-Czechoslovakia-Hungary, Australia-Canada-New Zealand, the Balkans, Ivory Coast-Ghana-Kenya, Germany, Egypt, Japan, Korea-Taiwan, Nigeria, Philippines-Thailand, Poland, Russia, Scandinavia, Turkey, USA and South Africa.

Table 1. Global (Concept 3) inequality in early 19th century

	This paper		Bourguignon and Morrisson (2002)	BFLZ (2009)
	1750-1880 Countries with social tables only	1750-1880 Countries with social tables plus distribution data from BM (year 1820)	1820	1820
	(1)	(2)	(3)	(4)
Gini	38.5	43.3	50.0	47.0
Theil (0)	60.9	57.9	52.2	n.a.
Average income of population included (in 1990 $PPP)	600	646	652*	687
Total population included (in m)	650	861	1057*	921
Population coverage (%)	~66	~90	~100	>90****
Number of countries***	13	29	33	40
Number of independent data points	591	<767	<<363**	n.a.

Note: The difference in total population in Columns (2) and (3) stems from the fact that countries with social tables enter population in column (2) with their actual populations in the year when the social table was created while in Column (3) they enter with their populations in year 1820. Thus in Column (2) India's population is 182 million and in Column (3) it is 209 million.
* Calculated directly from the Bourguignon-Morrisson tables, Data_WD19.xls (supplied by the authors separately from the paper). The 100 percent coverage by Bourguignon and Morrisson has to be taken with a grain of salt since the data were "forced" (through generous use of estimates) to cover 100 percent of the population.
** See footnote 2 above.
*** The number of countries is not fully comparable. For example, Bourguignon and Morrisson, treat Bangladesh/Pakistan and India as two countries; we treat them as one as the 1750 data refer to the entire subcontinent.
*** BFLF (Table 4) give 88 percent for their coverage but that number seems to be based on a somewhat higher estimate of the world population in 1820 than we use here.

2. The changing composition of global inequality, 1820-2002

While the social tables and (obviously) the survey data for the early 19th century are not fully available so that global inequality must always be estimated quite approximately, Maddison's GDP data allow us to compute with much more precision Concept 2 inequality. Concept 2 or international population-weighted inequality is an inequality index computed across GDPs per capita of countries at a given point in time, where each country's GDP per capita is weighted by country's population (see Milanovic, 2005).

Concept 2 and Concept 3 (or global) inequality are, in the case of Gini, linked as in relation (1). Concept 2 inequality also represents the between component of global inequality. This is inequality that would exist if each individual had mean income of his/her country, i.e., all individual country distributions were egalitarian. The within component (the part of global inequality due to income inequalities within each country) is the rest of expression (1).

$$\text{Global inequality} = \underbrace{\frac{1}{\mu}\sum_{i}^{n}\sum_{j>i}^{n}(y_j - y_i)p_i p_j}_{\text{Concept 2 inequality}} + \sum_{i}^{n} G_i \pi_i p_i + L \qquad (1)$$

where y_j = mean income or GDP per capita of country *j*, p_j = population share of country *j*, π_j = income share of country *j* (country *j*-th share in global income), μ = global average per capita income, and L = overlap term (which can be treated as part of the within component; it is greater than zero any time there are people from a poorer country that are better off than some people from a mean-richer country).

The difference between the Concepts 2 and 3 consists of *intra*-national inequality or, in other words, of the within component. Today, the between component—on account of huge differences in mean incomes between the countries—represents at least 85 percent of global inequality. [9] But was this the case in the past?

[9] See Milanovic (2005).

Table 2 provides Concept 2 computations for four dates in the 19th century for which Maddison provides a sufficient number of countries' GDPs per capita. We focus on years 1820 and 1870 when Maddison's data provide an almost full coverage of the world. Between these two dates, the Gini coefficient more than doubles from about 15 to 32. This reflects the well known phenomenon of income divergence that started in the 19th century. Concept 2 inequality continued to rise throughout the beginning of the 20th century, then stabilized at a rather high plateau of 55-60 Gini points between the end of World War II and fairly recently It has been decreasing in the past 20 years thanks to high growth rates of China and India.[10]

As the last two columns in Table 2 show, today's Concept 2 international inequality can be estimated at 60 to 63 Gini points, depending on whether we use GDPs per capita or survey means. This is some 7 Gini points higher than what we get when we use "old" PPPs. As already mentioned, this is because the new PPPs imply lower real incomes for China, India, Indonesia and a number of other Asian countries.

What is striking is not solely that Concept 2 inequality was much lower in 1820 than now but that the composition of global inequality was so much different.[11] Using our estimate of global inequality in the early 19th century of around Gini 43 points, we see that Concept 2 inequality represented then only 35 percent of global inequality: 15.2 Gini points out of 43 Gini points. (If we use Theil, the percentage is even smaller.) Today when global inequality is about 65-70 Gini points, [12] Concept 2 inequality accounts for 80 to 90 percent of global inequality measured by the Gini (see line 10 in Table 2). Using the Theil index, the share of population-weighted international inequality rises from 8 percent in 1820 to between 61 and 74 percent now (see the last line in Table 2).

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[10] This can be seen if we compare the data for 1980 and the first column for 2002 which is based on "old" PPPs (see Table 2).

[11] It should be noted that in the 19th century, we calculate Concept 2 inequality across only 60 countries while today we do it over twice as many. This imparts an upward bias to the latter.

[12] See Milanovic (2009). The "correct" 2002 global inequality is 70 Gini points, but I also use Gini of 65 derived from the "old" PPPs because of compatibility with Maddison's historical data based on the "old" PPPs.

Table 2. Concept 2 international population-weighted inequality and global inequality

	Using Maddison's GDP per capita and 1990 PPPs								Using WDI GDPs and "old" benchmark PPPs	Using household survey means and 2005 benchmark PPPs	Using WDI GDPs and 2005 benchmark PPPs
	1820	1850	1870	1913*	1929	1950	1960	1980	2002	2002	2002
(1) Concept 2 Gini	15.2	25.9	31.9	44.3	48.0	55.0	54.0	56.8	52.6	63.0	59.9
(2) Concept 2 Theil (0)	4.55	12.0	17.1	32.6	39.3	54.4	53.5	62.7	50.6	77.2	69.2
(3) Global average income (in $PPP)	689	916	911	1,599	1,941	2,111	2,778	4,520	7,099	3,665	8,123
(4) Total population included (in m)	941	623	1,178	1,666	1,775	2,518	3,030	4,423	5,775	5,802	6,004
(5) Estimated world population	1,057	1,201	1,266	1,719	2.042	2,518	3,030	4,423	6,172	6,172	6,172
(6) Population coverage (4)/(5) (in %)	89	52	93	97	87	100	100	100	94	94	99
(7) Number of countries	53	24	63	66	53	141	141	141	114	120	153
(8) Global inequality (Gini points)	43	53.2 (50)	56.0 (53)	61.0 (58)	61.6 (62)	64.0 (65)	63.5 (64)	65.7 (65)	65.4	70.7	70.7
(9) Global inequality (Theil 0)	58	48.5	54.4	66.8	69.0	77.5	76.6	85.0	82.5	104.8	104.8
(10) Share of between inequality in global Gini (1)/(8)	35	49	57	73	78	86	85	86	80	89	85
(11) Share of between inequality in global Theil (2)/(9)	8	25	31	49	57	70	70	74	61	74	66

Sources: All Concept 2 statistics calculated from Maddison's 2004 data, except for 2002, calculated from World Development Indicators (WDI) and World Income Distribution (WYD) database. Estimated global population from Bourguignon and Morrisson (2002, Table 1).Global inequality estimates (line 8) for the period 1850-1980 are from Bourguignon and Morrisson (on top) and from Baten, Foldvari, van Leeuwen and van Zanden (between brackets). Global inequality for the year 1820 as calculated here; for 2002, from Milanovic (2009).* Bourguignon and Morrisson population and global inequality data are for the year 1910. [2002 values calculated from my global_new.dta, except 2002 with 1990 PPPs calculated from world2002.dta.]

We can summarize the results by writing out the composition of global inequality in the early 19th and 21st century as follows:

Early 19th century: Inequality between individuals in the world: Gini around 43.

= 35 percent due to differences in average country incomes (15 Gini points)
+ 65 percent due to within-national income differences (28 Gini points).

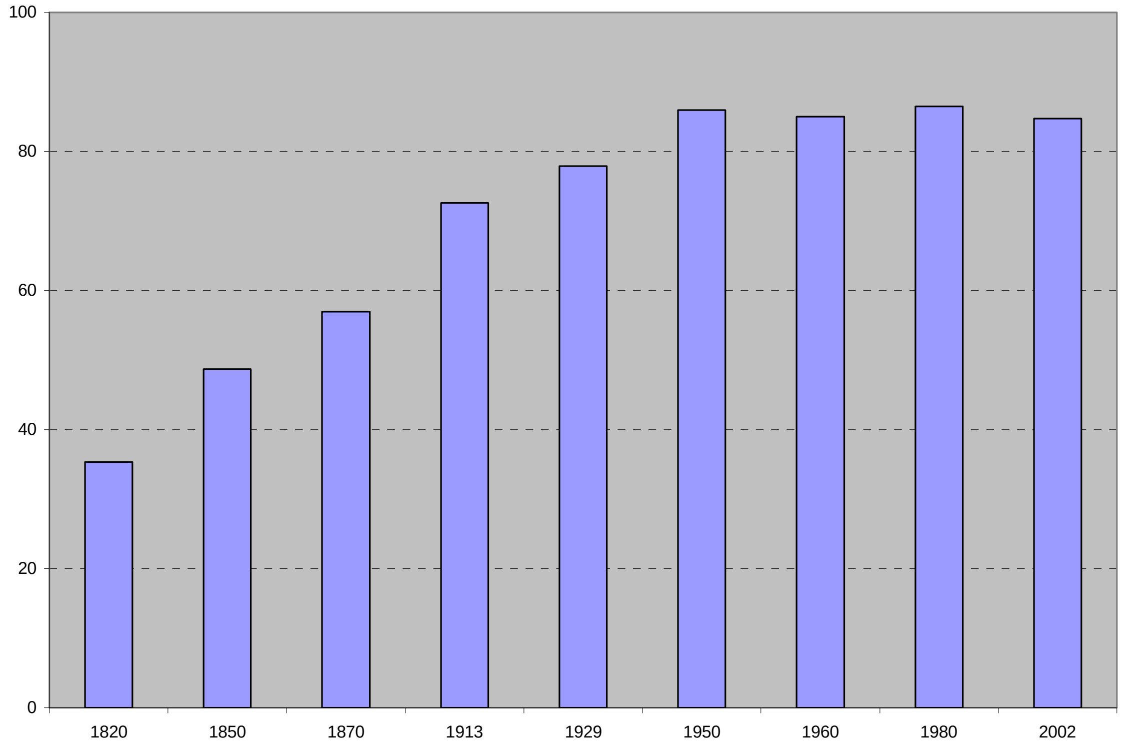
Early 21st century: Inequality between individuals in the world: Gini around 70.

= 85-90 percent due to differences in average country incomes (60-63 Gini)
+ 10-15 percent due to within-national income differences (7-10 Gini points).

These two simple relationships describe the change that has occurred globally during the last two centuries: inequality between individuals is much higher today than 200 years ago, but –more dramatically—its composition has totally reversed: from being predominantly driven by within-national inequalities (that is, by what could be called "class" inequality), it is today overwhelmingly determined by the differences in mean country incomes (what could be called "location" or citizenship-based inequality). This latter, "locational", element was "worth" 15 Gini points in the early 19th century; it is "worth" 60-63 Gini points today.

The evolution of the share of between inequality in global inequality is shown in Figure 1. The calculations are based on Milanovic's estimates of global inequality for 1820 and 2002, and Bourguignon and Morrisson's for all points in-between. With BFLZ estimates of global inequality, which are for the 19th century lower by about 3 Gini points than Bourguignon and Morrisson's (see Table 2), the share of between-country inequality in the 19th century would be slightly higher. The trend would not be affected however.

Figure 1. Share of between-country inequality in global inequality:
Selected years, 1820-2002 (in percent of global Gini)



Note: Based on Milanovic's estimates of global inequality for 1820 and 2002, and Bourguignon and Morrisson for all points in-between. Concept 2 inequality is calculated from Maddison (2004) data. Source: See Table 2.

3. Did global inequality extraction ratio decline?

Definition of the inequality extraction ratio. MLW (2009) have developed the concept of the inequality possibility frontier. Simply put, this is the maximum Gini that is achievable at a given level of mean income provided that all population but an infinitesimally small elite live at least at the subsistence minimum. To understand the concept intuitively, imagine a society whose mean income is just barely above subsistence. Then the maximum Gini, however small the elite (at the extreme, the elite could be composed of one individual), cannot be high because a vast majority (99.999% etc.) of bilateral income comparisons that enter into the creation of Gini will yield zeros (since all other individuals but the elite have the same, subsistence, income). As the average income grows, the constraint on the maximum Gini is relaxed. The inequality possibility frontier, the locus of maximum Ginis as mean income rises, is given by equation (2):

$$G(\alpha)^* = \frac{\alpha - 1}{\alpha}(1-\varepsilon) \qquad (2)$$

where α = average income of a community expressed in terms of subsistence, G^* = maximum feasible Gini, and ε = the share of the elite in total population. Clearly as $\varepsilon \rightarrow 0$, (2) simplifies to:

$$G(\alpha)^* = \frac{\alpha - 1}{\alpha} \qquad (3)$$

Thus, for example, if the average income of a community is twice the subsistence, the maximum feasible Gini will be 50 ((2-1)/2 expressed in percentage terms). But if, as in modern rich societies, the average income is some 100 times the subsistence, than the maximum feasible Gini is 99, very close to what we tended to regard (before the introduction of G*) as the maximum Gini regardless of average income level.

A similar calculation can be done for Theil(0). For Theil(0), the maximum feasible inequality is:

$$T(\alpha)^* = \ln(\alpha) \qquad (4)$$

The ratio between the actual (measured) Gini, G, and the maximum feasible Gini (G/G*) gives the inequality extraction ratio which can be interpreted as the share of maximum inequality extracted by the elite. (The same, of course, holds for the T/T* ratio.) Clearly, as that percentage increases, the elite can be said to have been more successful in extracting the surplus. The approach has been applied by MLW to 30 pre-industrial societies, running from the Imperial Rome in year 14 to Siam and Kenya in 1927.[13] The average extraction ratio over these 30 societies is 75 percent. For seven societies (six of them colonies), the extraction ratio was around 100 percent—that is, the inequality was pushed close to its maximum level, compatible with the physiological survival of the society. (Note that the Gini can even exceed the maximum if some people temporarily survive at less than the subsistence. In the medium term, the extraction ratios above 100 percent are possible only if population decreases.)

The stylized, but also very consistent picture, for modern developed societies is that of a decreasing inequality extraction ratio with rising mean per capita income. For example, for England and Wales (later United Kingdom) for which we have the most complete data series, the inequality extraction ratio drops from 70 percent in 1290 (when England's α was 2.1) to about 55 percent in 1688 and 1759 (α's of respectively 4.7 and 5.9), briefly increases to 60 percent in 1801 (α=6.7), and then begins a more or less steady decline to 38 percent today (α=66).[14] In other words, over the last century, inequality in developed countries generally decreased, or even when it went up, it increased less than the maximum feasible inequality.

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[13] And quite exceptionally India in 1947, at the independence from Britain.
[14] See MLW (2009, Table 2).

Global results. Now the question can be asked: Can the same methodology be applied globally? The answer is yes, but with one important caveat. When this methodology was applied to individual countries, it made sense also in implicitly assessing how rapacious or successful was the elite in extracting the surplus. Combined with an analysis of class structure of a given society (e.g., the share of the middle classes), it provided an insight into the social and political structure of a polity. At the global level, however, there is no single elite and no single government (then or now), and the application of the methodology makes sense certainly in an accounting sense, but perhaps much less as a tool that would enable us to gain further insight into the social structure of a given society (with society being here "the globe"). Yet, perhaps depending on one's perspective (e.g., taking a "world-systems" perspective) the global inequality extraction ratio could be seen as more than an accounting tool. In effect, the results obtained below will, to some extent, lead us to pose, if not to answer, that question.

The "accounting" part is useful because we may want to know whether the low measured Gini in the early 19th century (around 43 Gini points) can in part be "explained" by the overall low level of global income. Or differently, whether the increase in global inequality that we observe in the last two centuries is associated with the removal of the constraint that low income sets to the maximum feasible inequality.

Using the data on global average income (GDP per capita) from Table 2 (line 3) and assuming the subsistence minimum to be $PPP 300 (as in Milanovic, Lindert and Williamson, 2009) we can directly calculate G* and T* (see Table 3).

Table 3. Global inequality extraction ratio, 1820-2002

	Using Maddison GDP data and Milanovic global inequality estimate	Using Maddison GDP per capita at 1990 PPPs, and Bourguignon-Morrisson global inequality estimates							Using 2002 WDI GDPs and 2005 benchmark PPPs and Milanovic global inequality estimate
	1820	1850	1870	1913	1929	1950	1960	1980	2002
(1) Global average GDP per capita (in $PPP)	689	916	911	1599	1941	2111	2778	4520	5886
(2) Global average income to subsistence (ratio)	2.30	3.05	3.04	5.33	6.47	7.04	9.26	15.07	19.62
(3) Maximum feasible Gini (in %)	56	67	67	81	85	86	89	93	95
(4) Maximum feasible Theil (in %)	83	112	111	167	187	195	223	271	298
(5) Estimated global Gini	43	53.2	56.0	61.0	61.6	64	63.5	65.7	70.7
(6) Estimated global Theil(0)	58	49	54	67	69	78	77	85	105
(7) Estimated global Gini inequality extraction ratio (5/3; in %)	77	79	83	75	73	75	71	70	73
(8) Estimated global Theil inequality extraction ratio (6/4; in %)	70	43	49	40	37	40	34	31	35

Sources: 1820-1980 global average income calculated from Maddison's data; global Gini from Maddison and Bourguignon (2002) who base themselves on Maddison's data (all data in 1990 PPPs). 2002, global income calculated from World Development indicators (in 2002 PPPs, based on the benchmark 2005 ICP). Global inequality for 2002 calculated from Milanovic World Income Distribution (WYD) database; all in 2002 PPPs, based on the benchmark 2005 ICP. Therefore, the PPPs used for year 2002 differ from Maddison's 1990 Geary-Khamis PPPs by US CPI increase between 1990 and 2002 (38 percent) as well as by major revisions in relative price levels that occurred in 2005 International Comparison Project. The data for 2002 ($PPP 5886) correct for the former (that is, formally they are expressed in 1990 international prices) but cannot correct for the latter.

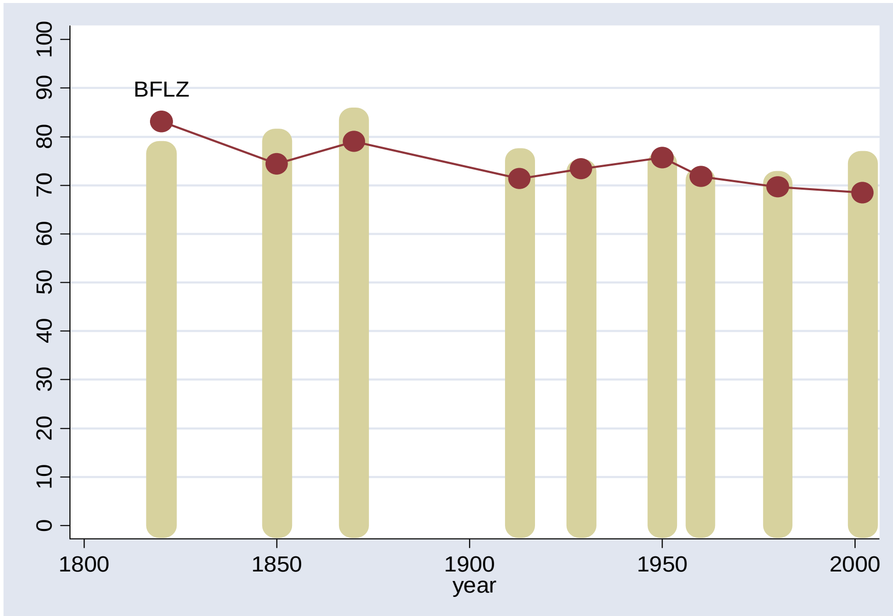
The striking fact, revealed by these numbers, is that the Gini-based global inequality extraction ratio today is at about the same level as in the early 19th century. If we use Bourguignon and Morrison's historical data, it could be said to have remained stable over the last two hundred years with the exception of a moderate tick up around 1850-1870 (Figure 2).[15] With BFLZ (2009) data, the Gini inequality extraction ratio in 19th century is somewhat higher, and accordingly is higher too than it is today. If we use the Theil-based inequality extraction ratio, today's values are significantly lower than those of the early 19th century, but after 1910, there is little downward movement (Figure 3). For the last one hundred years, we do not see any compelling evidence that there was a decline in the global inequality extraction ratio, measured either by the Gini or Theil index. What has happened is that the actual global Gini has risen *pari passu* with the maximum feasible Gini thus broadly keeping the inequality extraction ratio constant (see Figure 4).[16]

Combining this with the earlier finding that the composition of global inequality has shifted from being "caused" by internal factors, like domestic income distribution, to "external" like differences in mean country incomes, we can conclude that the main "inequality extractors" today are not (within)-national elites, but an elite which is basically composed of the citizens of rich countries.

[15] The result also shows why the Bourguignon-Morrisson estimate of Gini 50 for global inequality in 1820 is implausibly high. Using their own global mean income of $PPP 652, it can be shown that the maximum feasible Gini could be only 54 points and that the inequality extraction ratio would have to be greater than 90 percent. This cannot be totally rejected but seems implausibly high in light of the results for the subsequent years.

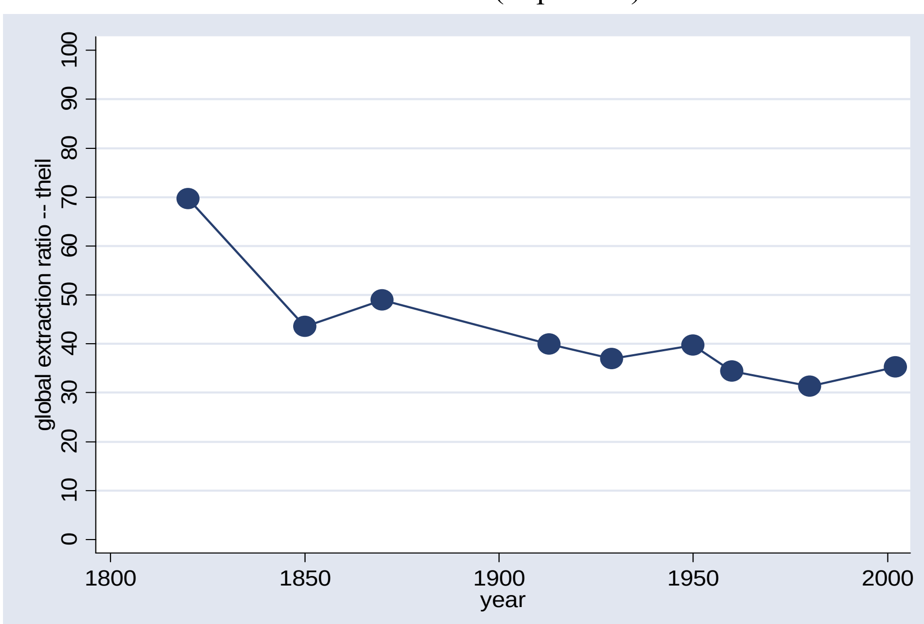
[16] The "extraction" levels are quite different depending on whether we use Gini- or Theil-based measures. However, our concern here is not with the levels as such but with changes in the levels and in that respect both Gini- and Theil-based extraction ratios are in agreement for the period of the last one hundred years. Note that the Theil index is much more sensitive to the extreme values than the Gini. Thus the maximum feasible Theil increases faster as α goes up than the maximum feasible Gini. It can be readily verified from equations (3) and (4) that the slope of Gini-based Inequality Possibility Frontier is $1/\alpha^2$ while the slope of Theil-based Inequality Possibility Frontier is $1/\alpha$. Thus the former is more concave (see Figure 4).

Figure 2. Global Gini inequality extraction
ratio 1820-2002 (in percent)



Note: Bars based on the data from Table 3. Dots based on global inequality calculations of Baten, Foldvari, van Leeuwen, and van Zanden (2009). [From summary_utrecht.dta.]

Figure 3. Global Theil inequality extraction
ratio 1820-2002 (in percent)



.

Source: Table 3.

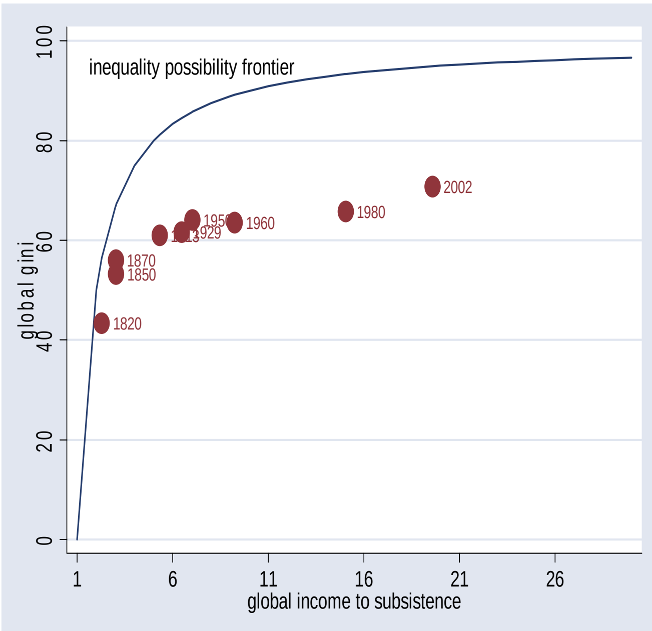
We can summarize the change that occurred over the last century as follows:

> Early 20th century: Global mean income was 5.3 times the subsistence. Maximum feasible global Gini was 81 points while the actual global Gini was 61. Thus, actual inequality "exhausted" ¾ of maximum inequality. (Using Theil index that proportion was 40 percent.)

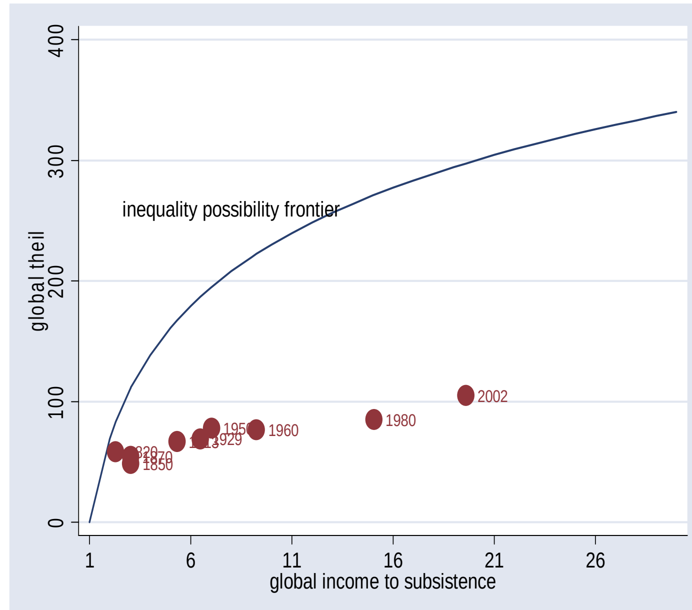
> Early 21st century: Global mean income is 19.6 times the same physiological subsistence. Maximum feasible global Gini is 93 while the actual global Gini is around 70. Thus, actual inequality "exhausted" (still) some ¾ of maximum inequality. (Using Theil index that proportion is 35 percent.) Whether we use Gini or Theil to calculate global inequality indices, the level of inequality extraction has remained remarkably stable between 1900 and 2002.

Figure 4. Global inequality frontier and global inequality, 1820-2002

Gini



Theil



Note: All global average incomes, including for 2002 expressed in 1990 PPP (see note to Table 3). [From summary_utrecht.dta.]

Why is world income distribution such that during the last century, the rich have extracted a constant of about 70 percent of global (Gini) maximum feasible inequality? This is a question that, due to its complexity, cannot be answered in this paper. However, regarding the future we may hazard some projections. Since global mean income is already quite high, almost 20 times the subsistence, the increase in the maximum feasible Gini will be quite limited. This means that the only venue for the reduction in global inequality extraction ratio remains an effective reduction in measured global inequality. For it to go down, inter-country differences in mean incomes must decrease, and in particular those between poor and rich populous countries. Thus, both global inequality and global inequality extraction ratio fundamentally depend on what I called elsewhere (Milanovic 2005), the relationship within the triangle of China, India and the United States. If the mean-normalized absolute distance between China and India, on the one hand, and the US, on the other, decreases, then we are likely to observe favorable developments in this century. [17]

[17] Note that for the Gini to go down, it is not sufficient that China grows faster than the US. China must grow sufficiently fast to reduce the *absolute* distance, normalized by world mean income, with the United States. Suppose that the world mean income is constant, and US grows by 1 percent per capita per annum. For the US-China Gini component to be reduced, China needs to grow by 10 percent per capita per annum (since its mean per capita income is about 1/10th of the US level).

4. Conclusions

Several conclusions can be made.

1. Global inequality around 1820 was probably 43-45 Gini points rather than 50 points as estimated by Bourguignon and Morrisson (2002). The latter value would have implied an unlikely high inequality extraction ratio of around 90 percent.

2. Global inequality increased from 43-45 Gini points in the early 19th century to some 65-70 Gini points today. Even more remarkable is that the composition of global inequality changed from being driven by class differences within countries to being driven by locational income differences (that is, by the differences in mean country incomes). The latter accounted for only 15 Gini points around 1820, but account for more than 60 Gini points today.

3. Although the inequality extraction ratios have steadily and often dramatically decreased within individual countries as they developed in the course of the last two centuries (see MLW, 2009), the global inequality extraction ratio has only mildly declined since its 19th century level and has remained broadly stable in the last 100 years.

4. This means that global inequality has increased at about the same rate as the maximum feasible inequality (the latter's increase being determined by the rise in mean global income), leaving the (Gini-based) global inequality extraction ratio at around 70 percent.

5. The implication of (a) changing composition of global inequality, and (b) stable inequality extraction ratio is that the main "inequality extractors" today are citizens of rich countries rather than individual national elites as was the case 200 years ago.

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ANNEX: Social table for England and Wales 1801-03

Social group	Number of people	Percentage of population	Per capita income (in £ per annum)	Income in terms of per capita mean
Paupers	1040716	11.5	2.5	0.11
Persons imprisoned for debt	10000	0.11	6	0.27
Laborers in husbandry	1530000	16.9	6.9	0.31
Hawkers, pedlars, duffers	4000	0.04	8	0.36
Laborers in mines, canals	180000	1.99	8.9	0.41
Vagrants	175218	1.94	10	0.46
Artisans, mechanics, laborers	2005767	22.16	12.2	0.56
Clerks and shopmen	300000	3.31	15	0.68
Freeholders, lesser	600000	6.63	18	0.82
Farmers	960000	10.6	20	0.91
Innkeepers and publicans	250000	2.76	20	0.91
Lesser clergymen	50000	0.55	24	1.09
Dissenting clergy, itinerants	12500	0.14	24	1.09
Education of youth	120000	1.33	25	1.14
Military officers	65320	0.72	27.8	1.27
Common soldiers	121985	1.35	29	1.32
Naval officers	35000	0.39	29.8	1.36
Shopkeepers and tradesmen	372500	4.11	30	1.37
Tailors, milliners, etc.	125000	1.38	30	1.37
Confined lunatics	2500	0.03	30	1.37
Freeholders, greater	220000	2.43	36.4	1.66
Marines and seamen	52906	0.58	38	1.73
Lesser offices	52500	0.58	40	1.82
Engineers, surveyors, etc.	25000	0.28	40	1.82
Merchant service	49393	0.55	40	1.82
Keeping houses for lunatics	400	0.004	50	2.28
Theatrical pursuits	4000	0.04	50	2.28
Liberal arts and sciences	81500	0.9	52	2.37
Law, judges to clerks	55000	0.61	70	3.19
Eminent clergymen	6000	0.07	83.3	3.8
Gents	160000	1.77	87.5	3.99
Shipowners, freight	25000	0.28	100	4.56
Higher civil offices	14000	0.15	114.3	5.21
Lesser merchants, by sea	91000	1.01	114.3	5.21
Building & repairing ships	1800	0.02	116.7	5.32
Warehousemen, wholesale	3000	0.03	133.3	6.08
Manufacturers	150000	1.66	133.3	6.08
Knights	3500	0.04	150	6.84
Esquires	60000	0.66	150	6.84
Educators in universities	2000	0.02	150	6.84
Baronets	8100	0.09	200	9.12
Eminent merchants, bankers	20000	0.22	260	11.86

Social group	Number of people	Percentage of population	Per capita income (in £ per annum)	Income in terms of per capita mean
Spiritual peers	390	0.004	266.7	12.16
Temporal peers	7175	0.08	320	14.59
Total	*9053170*	*100*	*21.93*	*1*

Source: Milanovic, Lindert and Williamson (2009, Appendix 1).